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Water Security Research and Policy: EPA's *Water Security Research and Technical Support Action Plan*

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Water—every drop of it—is a precious natural resource that Americans once enjoyed with little thought to potential tampering by terrorists or others. Today, however, U. S. citizens are increasingly aware of threats of harm to our homeland. The terrorist attacks of September 11, 2001, and the delivery of anthrax-contaminated letters later that year have taught all of us to anticipate threats to our waters.

Terrorist threats are targeted not just at individuals, but also at the country's vital institutions and infrastructure, including the nation's drinking water and wastewater systems. Government, water utilities, state and local water agencies, public health organizations, emergency and follow-up responders, and academia, as well as the private sector from across the country must be ready to protect water infrastructure. These organizations are working together to reduce vulnerabilities to terrorism, prevent and prepare for terrorist attacks, minimize public health impacts and infrastructure damage, and enhance recovery from any attacks that may occur.

In 2002, the Administration developed a road map for securing the homeland—*The National Strategy for Homeland Security*¹—which lays out specific objectives for border and transportation security, emergency preparedness and response, protecting critical infrastructure, domestic counterterrorism, defending against catastrophic threats, and intelligence and warning. This road map designates

the United States Environmental Protection Agency (EPA) as the lead federal agency for protecting critical drinking water and wastewater treatment and distribution system infrastructure.

EPA's Role in Water Security

The Public Health Security and Bioterrorism Preparedness and Response Act (Bioterrorism Act) of 2002² is the legislative mandate for EPA's work in water security. This law, coupled with executive directives and the Agency's own strategic plan for homeland security, guide the Agency's research and technical support activities to protect water infrastructure. The Homeland Security Presidential Directive on Critical Infrastructure Identification, Prioritization, and Protection (HSPD-7)³ reinforces EPA's role as the sector-specific lead for water infrastructure. It also assigns the responsibility of coordinating the overall national effort to protect critical infrastructure and key resources of the United States to the Department of Homeland Security.

As the sector-specific federal lead for protecting the nation's drinking water and wastewater infrastructures, EPA plays a critical role in the homeland security arena. To meet these responsibilities, the Agency's Office of Water (OW) established the Water Protection Task Force. In August 2003, the Task Force was organized formally as the Water Security Division (WSD). Additionally,

the Agency's Office of Research and Development (ORD) officially established the National Homeland Security Research Center (NHSRC) in February 2003. These organizations work together to provide research and technical support for the drinking water and wastewater sectors.

NHSRC's Water Security Team contributes by conducting applied research and then reporting on ways to better secure the nation's water systems from threats and attacks. The Water Security Research Program produces analytical tools and procedures, technology evaluations, models and methodologies, decontamination techniques, technical resource guides and protocols, and risk assessment methods. All of these products are for use by EPA's key water infrastructure customers—water utility operators, public health officials, and emergency and follow-up responders (see Table 1). Other research programs in NHSRC deal with the protection of buildings and rapid risk assessment.

EPA's WSD provides support to drinking water and wastewater systems by preparing vulnerability assessment and emergency response systems and tools, providing technical and financial assistance, and developing information exchange mechanisms. WSD is also charged with supporting best security practices, providing security enhancement guidance, and incorporating security into the day-to-day operations of the drinking water and wastewater sectors. In addition, WSD works closely with NHSRC in delivering research results in a timely and appropriate fashion.

Along with providing research and technical support, both NHSRC and WSD encourage information sharing and risk communication strategies among key water infrastructure customers. This includes making use of the Water Information Sharing and Analysis Center (WaterISAC)⁴.

Table 1. Potential users of information developed under the *Action Plan*.

Water industry representatives
State, regional, and local response organizations
Public health officials and organizations
Federal agencies and departments
Laboratories with water sample testing capabilities
Individuals and organizations with water expertise
Elected officials and the public

Water Security Research and Technical Support Action Plan

To better understand the security problems of the water industry in the United States, EPA has engaged in conversation with numerous water experts and stakeholders from government, industry, and academia. Other key participants are representatives from public health organizations, emergency responders and follow-up responders, law enforcement officials, environmental groups, and related professional associations.

As a result of these meetings, EPA has gained valuable insights on the vulnerabilities and technical challenges facing the water industry for which research and technical support are crucial. With assistance from other federal agencies and contractors, both WSD and NHSRC are addressing these challenges. Issues, needs, and projects are summarized in the comprehensive *Water Security Research and Technical Support Action Plan*⁵, otherwise known as the *Action Plan*.

Much of the work described in the *Action Plan* has begun, and what is not underway will begin during the next few months. The *Action Plan* must be recognized as a snapshot in time. As new information is developed on threats, contaminants, and threat situations, adjustments will most certainly be necessary. Revisions to the *Action Plan* will be made periodically based on input from others dealing with drinking water and wastewater security. The *Action Plan* will also evolve based on changing needs in the homeland security arena.

The *Action Plan* addresses drinking water supply, water treatment, finished water storage, and drinking water distribution system infrastructure. It also addresses wastewater treatment and collection infrastructure, which includes sanitary and storm sewers or combined sanitary-storm sewer systems, wastewater treatment, and treated wastewater discharges to rivers, estuaries, and lakes.

Research and Technical Support Questions

In various meetings with EPA, federal partners and water stakeholders discussed issues, needs, and projects to secure water infrastructure and safeguard water quality. The *Action Plan* developed as a result of these meetings describes research and technical support that addresses many questions focused on protecting water infrastructure. Some of the questions are as follows:

Drinking water questions

1. What are the most plausible threats, contaminants, and threat scenarios facing the water industry? How does this information compare with intelligence information on possible threats?
2. How could computers be tampered with, particularly supervisory control and data acquisition systems to negatively impact water system operations? What might those impacts be and how best can such tampering be prevented or minimized?
3. What would be the cascading effects of an attack on a water system, and what are the impacts on water systems when other critical infrastructure systems malfunction? How can these effects or impacts be minimized?
4. What types of biological and chemical contaminants could be introduced into water systems and what are their physical, chemical, and biological properties? What are the potential health impacts of these contaminants?
5. What are the most effective means to detect contaminants in water? How can this information be combined with reporting, analysis, and decision making to arrive at a reliable and cost effective early warning system?
6. Do surrogates, or chemical, biological, and biochemical alternatives exist that might be safely used for research and testing purposes in place of hazardous and potentially lethal agents? How reliable are these surrogates in representing actual agent characteristics in water?
7. Can effective methods be developed to ensure that a sufficient number of qualified laboratories exist to perform rapid analysis of water contaminants in the event of an attack?
8. If contaminants are introduced into a water system, where will they travel? How quickly will they travel? What will be their concentration at various points along their path? Can the human health impacts of these contaminants be effectively minimized?
9. How can water that has been contaminated be effectively treated so that it can be released to wastewater systems or otherwise effectively disposed of?

10. How can water materials and equipment that are contaminated, be cleaned, and returned to service as quickly as possible after an attack? What are the best ways to determine residual contamination, if any, that might linger over the long term?
11. Are alternative water supplies available in the event of an attack? How would water utilities or governments most effectively supply clean water to affected communities and business in both the short and long term?
12. What are the routes of human exposure to contaminants if a water system is attacked?
13. What are the acute and chronic impacts from these exposures and can they be adequately represented based on existing risk information?
14. Can a health surveillance network be established to rapidly identify disease outbreaks associated with contaminated water? Are there other means of providing early warnings or alerts from water contamination using surrogate health data?

Wastewater questions

1. What are the risks of hazardous substances that may be introduced into wastewater treatment systems?
2. Can intrusion and surveillance monitoring technologies be improved to rapidly detect water contamination and alert authorities should a wastewater facility be compromised?
3. Are alternative wastewater treatments and discharge locations available in the event of an attack?

Information questions

1. How best can emergency responders, public health officials, health care providers, and the public be effectively and efficiently informed in the event of an attack?

Recommendations from partner and stakeholder meetings are organized in the *Action Plan* under the seven issues listed in Figure 2. The plan describes significant research needs for these categories and lists specific projects for each need (refer to the *Action Plan* for more information). Although the *Action Plan* focuses primarily on biological and chemical (including radiological) contaminants in drinking water systems, it also addresses physical and cyber threats,

Table 2. Example *Action Plan* Needs

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- **Ensure the protection of existing water infrastructure.**
 - **Enhance cyber security and other external means of disrupting water systems.**
 - **Identify and characterize threats that could be used to disrupt water systems.**
 - **Develop methods for detecting and monitoring contaminants in water.**
 - **Create rapid screening technologies for the identification of unknown contaminants.**
 - **Test and evaluate the performance of sensors and biomonitors.**
 - **Improve detectors and early warning systems for water distribution and collection systems.**
 - **Enhance models for contaminant transport in pipes and distribution systems.**
 - **Refine fate and transport information for contaminants in water.**
 - **Develop treatment or inactivation techniques for water contaminants.**
 - **Evaluate and improve decontamination and disposal techniques for contaminated materials and equipment.**
 - **Establish contingency planning and infrastructure backup procedures.**
 - **Improve methods for assessing risks to the public from water contamination.**
 - **Enhance risk communication and information sharing among individuals and organizations dealing with a threat or attack.**
 - **Provide training and exercises that enhance preparedness, response, and mitigation to water system threats or attacks.**

contingency planning, risk assessment and risk communication, and infrastructure interdependencies. The *Action Plan* focuses on research to:

1. Protect drinking water systems from physical and cyber threats
2. Identify drinking water threats, contaminants, and threat scenarios
3. Improve analytical methodologies and monitoring systems for drinking water
4. Contain, treat, decontaminate, and dispose of contaminated water and materials
5. Plan for contingencies and address infrastructure interdependencies
6. Target impacts on human health and inform the public about risks
7. Protect wastewater treatment and collection systems

***Action Plan* Schedule and Products**

The challenges facing the Agency in protecting water infrastructure are interdependent and complex. The goal of the *Action Plan*, however, is to provide useful and timely products to key customers by the end of 2005 and, of course, along the way. To accomplish this goal, EPA is partnering with other

federal agencies, national laboratories, non-governmental water industry research groups, and the private sector to build on existing strengths, share the workload, and take advantage of related research already underway. One example of this is the Distribution System Research Consortium, formed by NHSRC and WSD. The consortium meets twice a year to address research and technical support issues around distribution systems. Members include representatives from the Department of Homeland Security, the Centers for Disease Control and Prevention, the Department of Defense, the Department of Energy, and the U. S. Geological Survey, among others. Work in progress will also be shared in open forums such as journals, conferences, and workshops. If the information is sensitive, it will be shared through more limited venues such as the WaterISAC.

EPA's research and technical support activities will result in various types of products, tools, and technologies, such as those listed in Table 3. These will be available to the water industry, public health officials, elected officials, health care providers, emergency responders, and others to aid in the fight against terrorism. A listing of all available research products, as well as many of the products themselves, will be placed on NHSRC's Web site at: <http://>

Table 3. Action Plan Products

Computerized data compendiums
Response guides and protocols
Technical resource documents, case, studies, and model procedures
Laboratory methods and protocols
Communication tools and frameworks
Technology screening, evaluation, and verification
Workshops and seminars
Computerized tools and software systems
Risk assessment methods and procedures
Journal articles, fact sheets and technical bulletins

www.epa.gov/ordnhsrsc. An internet-based catalog with publicly-available products from both WSD and NHSRC will be located on the WSD Web site at: <http://www.epa.gov/safewater/security>. EPA information clearinghouses, booths at conferences and workshops, and announcements and press releases will be used to deliver *Action Plan* results as well.

Additional Information

With a long history in environmental protection, and assessing and managing risks, EPA is well positioned to develop the tools and technologies that address threats to and attacks on drinking water and wastewater systems. As the lead for the research under this *Action Plan*, NHSRC is providing applied research that can be used quickly by those with a stake in securing water system infrastructure. As the lead for technical support to key customers in the water arena, WSD is charged with a much broader responsibility that is informed by NHSRC's research. The *Water Security Research and Technical Support Action Plan* is a joint and collaborative undertaking that involves both organizations. Such an approach in addressing water security has worked well to date and will continue into the future.

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Notes

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